

1 **(December 6, 2004)**

2 **Contractor Surveying - Roadway**

3 Copies of the Contracting Agency provided primary survey control data are available for
4 the bidder's inspection at the office of the Project Engineer.

5
6 The Contractor shall be responsible for setting, maintaining, and resetting all alignment
7 stakes, slope stakes, and grades necessary for the construction of the roadbed,
8 drainage, surfacing, paving, channelization and pavement marking, illumination and
9 signals, guardrails and barriers, and signing. Except for the survey control data to be
10 furnished by the Contracting Agency, calculations, surveying, and measuring required
11 for setting and maintaining the necessary lines and grades shall be the Contractor's
12 responsibility.

13
14 Detailed survey records shall be maintained, including a description of the work
15 performed on each shift, the methods utilized, and the control points used. The record
16 shall be adequate to allow the survey to be reproduced. A copy of each day's record
17 shall be provided to the Engineer within three working days after the end of the shift.

18
19 The meaning of words and terms used in this provision shall be as listed in "Definitions
20 of Surveying and Associated Terms" current edition, published by the American
21 Congress on Surveying and Mapping and the American Society of Civil Engineers.

22
23 The survey work shall include but not be limited to the following:

- 24
- 25 1. Verify the primary horizontal and vertical control furnished by the Contracting
26 Agency, and expand into secondary control by adding stakes and hubs as well
27 as additional survey control needed for the project. Provide descriptions of
28 secondary control to the Contracting Agency. The description shall include
29 coordinates and elevations of all secondary control points.
 - 30
31 2. Establish the centerlines of all alignments, by placing hubs, stakes, or marks
32 on centerline or on offsets to centerline at all curve points (PCs, PTs, and PIs)
33 and at points on the alignments spaced no further than 20 meters.
 - 34
35 3. Establish clearing limits, placing stakes at all angle points and at intermediate
36 points not more than 20 meters apart.
 - 37
38 4. Establish grading limits, placing slope stakes at centerline increments not more
39 than 20 meters apart. Establish offset reference to all slope stakes.
 - 40
41 5. Establish the horizontal and vertical location of all drainage features, placing
42 offset stakes to all drainage structures and to pipes at a horizontal interval not
43 greater than 10 meters.
 - 44
45 6. Establish roadbed and surfacing elevations by placing stakes at the top of
46 subgrade and at the top of each course of surfacing. Subgrade and surfacing
47 stakes shall be set at horizontal intervals not greater than 20 meters in tangent
48 sections, 10 meters in curve sections with a radius less than 100 meters, and
49 at 3-meter intervals in intersection radii with a radius less than 3 meters.
50 Transversely, stakes shall be placed at all locations where the roadway slope
51 changes and at additional points such that the transverse spacing of stakes is
52 not more than 4 meters.

7. Establish intermediate elevation benchmarks as needed to check work throughout the project.
8. Provide references for paving pins at 10 meter intervals or provide simultaneous surveying to establish location and elevation of paving pins as they are being placed.
9. For all other types of construction included in this provision, (including but not limited to channelization and pavement marking, illumination and signals, guardrails and barriers, and signing) provide staking and layout as necessary to adequately locate, construct, and check the specific construction activity.

The Contractor shall provide the Contracting Agency copies of any calculations and staking data when requested by the Engineer.

To facilitate the establishment of these lines and elevations, the Contracting Agency will provide the Contractor with primary survey control information consisting of descriptions of two primary control points used for the horizontal and vertical control, and descriptions of two additional primary control points for every additional 5 kilometers of project length. Primary control points will be described by reference to the project alignment and the coordinate system and elevation datum utilized by the project. In addition, the Contracting Agency will supply horizontal coordinates for the beginning and ending points and for each Point of Intersection (PI) on each alignment included in the project.

The Contractor shall ensure a surveying accuracy within the following tolerances:

	<u>Vertical</u>	<u>Horizontal</u>
Slope stakes	±30 millimeters	±30 millimeters
Subgrade grade stakes set 15 millimeters below grade	±5 millimeters	±150 millimeters (parallel to alignment) ±30 millimeters (normal to alignment)
Stationing on roadway	N/A	±30 millimeters
Alignment on roadway	N/A	±15 millimeters
Surfacing grade stakes	±5 millimeters	±150 millimeters (parallel to alignment) ±30 millimeters (normal to alignment)
Roadway paving pins for surfacing or paving	±5 millimeters	±60 millimeters (parallel to alignment) ±30 millimeters (normal to alignment)

The Contracting Agency may spot-check the Contractor's surveying. These spot-checks will not change the requirements for normal checking by the Contractor.

1 When staking roadway alignment and stationing, the Contractor shall perform
2 independent checks from different secondary control to ensure that the points staked
3 are within the specified survey accuracy tolerances.
4

5 The Contractor shall calculate coordinates for the alignment. The Contracting Agency
6 will verify these coordinates prior to issuing approval to the Contractor for commencing
7 with the work. The Contracting Agency will require up to seven calendar days from the
8 date the data is received.
9

10 Contract work to be performed using contractor-provided stakes shall not begin until the
11 stakes are approved by the Contracting Agency. Such approval shall not relieve the
12 Contractor of responsibility for the accuracy of the stakes.
13

14 Stakes shall be marked in accordance with Standard Plan H-14. When stakes are
15 needed that are not described in the Plans, then those stakes shall be marked, at no
16 additional cost to the Contracting Agency as ordered by the Engineer.
17

18 ***Payment***

19 Payment will be made in accordance with Section 1-04.1 for the following bid item when
20 included in the proposal:
21

22 "Roadway Surveying", lump sum.
23

24 The lump sum contract price for "Roadway Surveying" shall be full pay for all labor,
25 equipment, materials, and supervision utilized to perform the work specified, including
26 any resurveying, checking, correction of errors, replacement of missing or damaged
27 stakes, and coordination efforts.